Names_____ & _____

Pasta Tower Challenge

Define the following terms:

Compression	
Tension	
Load	

Background

Have you ever wondered how really tall buildings stay up? Why do skyscrapers not fall down when wind hits them? Engineers work with architects and scientists to understand what makes materials break, and then use what they learn to design strong structures. Today, you will have the opportunity to figure out how to make a strong structure, too. Sometimes, engineers may be able to find very strong materials, but they cannot use them in a structure because the materials are too expensive. Sometimes, engineers cannot use as much material as they might like due to budget or supply limitations. Just like an engineer, today you will be constrained; you can only use a limited amount of materials. Your job is to design and build a structure that is as tall and strong as possible, using only marshmallows and spaghetti.

As you build, think about what forces will be acting upon your structure. Which parts will be pushed together, that is, which will experience *compression* and which parts will be pulled apart, that is, which will be under *tension*. Is it better to have a piece of spaghetti or a marshmallow under tension? Under compression? How will you design the tallest, strongest structure using limited resources?

Circle the answer:

1. Spaghetti is stronger in: *tension or compression*

2. Marshmallows are stronger in: *tension or compression*

3. Examine the pictures. Circle the 2 structures you think are strongest. Explain why.

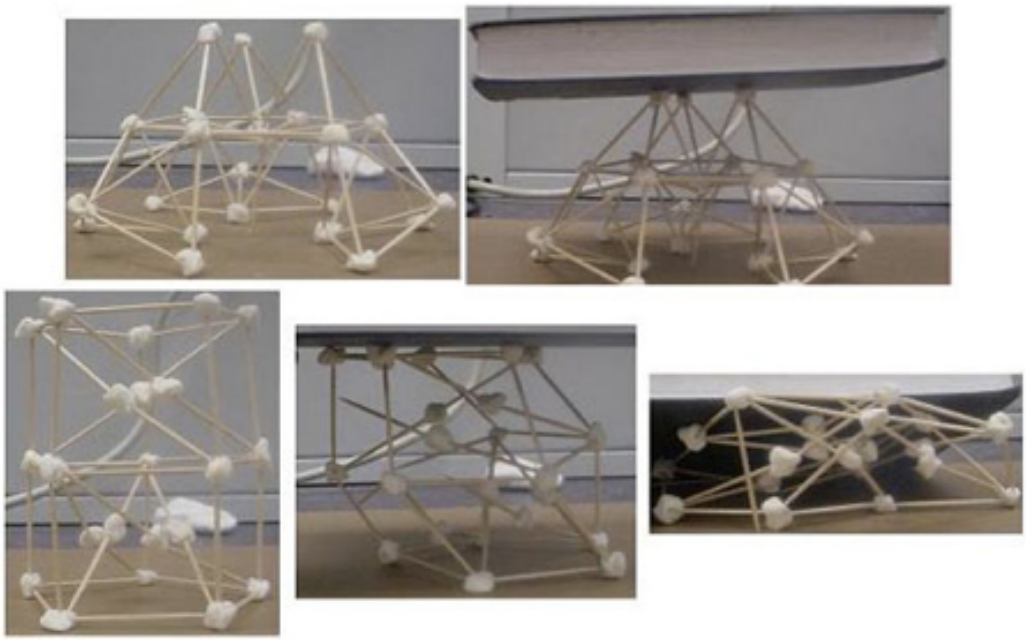


Image credit: Ben Heavner, ITL Program and Laboratory, University of Colorado at Boulder, 2004.

BEFORE YOU BUILD

Sketch your design idea:

4. How tall do you *think* this structure will be?

5. Why do you *think* this design will be able to hold more weight than other designs?

Collect your materials

- 20 unbroken pieces of uncooked, long pasta, such as spaghetti, linguine or fettuccini
- 30 small marshmallows
- Measuring tape or ruler – will be shared with the class
- Weights (bags of sand)

Build you structure.

You many only use the materials provided.
You may not trade, exchange with or steal from other groups.

Take a picture of your completed tower and insert it here. Draw an arrow to a point of tension in your tower and label it. Draw an arrow to a point of compression in your tower and label it.

6. How tall was your structure?

7. How much does your tower weigh?

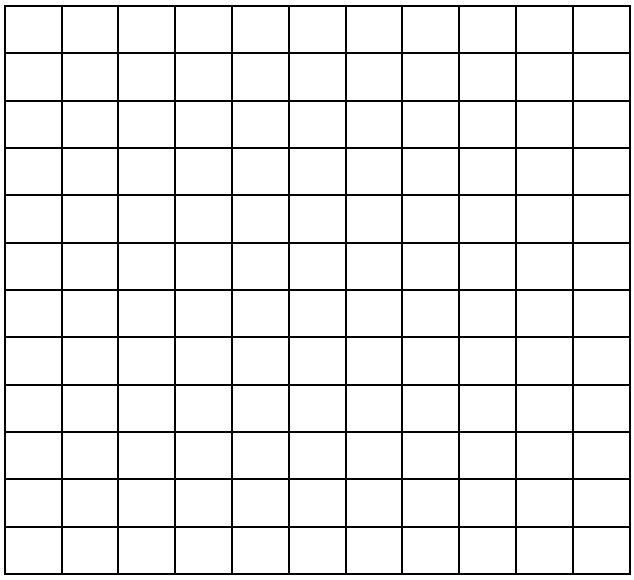
8. How much weight did you put on your structure before it fell?

9. What was the efficiency of your tower?
(max weight the tower held / weight of tower)

Graph the efficiency of each tower in the class

Look at the structures and efficiency calculations of your classmates. Record the data.

(**Label** the TITLE, the X axis and Y axis)



Reflection and Discussion

10. Which structure was the tallest and held the most weight.

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11. Why do you think some designs were more efficient than others?

12. Which structures had the highest ratio of load to structure weight?

13. Which structures held the most weight, regardless of height, and why (think about which geometric shapes seed the strongest)

14. What would you do differently if you were to build this kind of structure again? Why?